

TABLE 5. PIPE SIZES FOR UNDERGROUND SUPPLY MAINS BASED ON A VELOCITY OF 10,000 FT. PER MINUTE—(Continued)

(continued)

GAGE PRESSURE LB.	LB. STEAM PER MINUTE	TOTAL B.T.U. ABOVE 200 DEG. FAHR. PER HR.	PIPE LOSS B.T.U. PER HOUR, PER FT. LENGTH		LB. STEAM CONDENSED PER FOOT PER FT. LENGTH
			Bare	Covered (10% of Bare)	
6 in. Pipe					
0	74.6	4,504,000	585	58.5	0.0604
10	122	7,260,000	719	71.9	0.0755
20	167	10,020,000	852	85.2	0.0918
40	256	15,360,000	1037	104	0.1135
60	345	20,880,000	1186	119	0.1320
80	427	26,040,000	1311	131	0.1470
100	514	31,440,000	1428	143	0.1630
120	606	37,260,000	1528	153	0.1760
140	690	42,480,000	1620	162	0.1880
160	770	47,400,000	1694	169	0.1980
180	870	53,700,000	1785	178	0.2110
200	950	58,800,000	1872	187	0.2230
8 in. Pipe					
0	134	7,980,000	760.7	76.1	0.0785
10	218	12,960,000	936.7	93.7	0.0985
20	298	17,940,000	1109.5	110.9	0.118
40	458	27,540,000	1351	135.1	0.147
60	617	37,560,000	1543	154.3	0.171
80	765	46,680,000	1707	170.7	0.191
100	917	56,160,000	1859	185.9	0.212
120	1080	66,480,000	1988	198.8	0.229
140	1230	75,300,000	2107	210.7	0.244
160	1375	84,600,000	2207	220.7	0.258
180	1550	95,400,000	2325	232.5	0.275
200	1700	105,600,000	2443	244.3	0.291
10 in. Pipe					
0	211	12,420,000	949	94.9	0.0978
10	345	19,520,000	1170	117.0	0.1230
20	474	28,380,000	1384	138.4	0.1480
40	730	43,860,000	1685	168.5	0.1840
60	983	59,760,000	1927	192.7	0.2130
80	1210	73,800,000	2132	213.2	0.2390
100	1455	89,100,000	2322	232.2	0.264
120	1670	102,600,000	2486	248.6	0.286
140	1960	120,600,000	2635	263.5	0.306
160	2180	134,400,000	2755	275.5	0.323
180	2470	152,400,000	2903	290.3	0.343
200	2700	166,800,000	3051	305.1	0.364
12 in. Pipe					
0	297	17,460,000	1125	112.5	0.116
10	485	28,860,000	1387	138.7	0.146
20	664	39,900,000	1641	164.1	0.175
40	1020	62,100,000	1999	199.9	0.218
60	1372	83,400,000	2240	224.0	0.248
80	1700	103,800,000	2529	252.9	0.284
100	2040	124,800,000	2753	275.3	0.314
120	2410	148,200,000	2945	294.5	0.340
140	2750	169,200,000	3121	312.1	0.362
160	3060	182,400,000	3266	326.6	0.383
180	3460	213,600,000	3440	344.0	0.406
200	3800	235,200,000	3616	361.6	0.430

Example: Find the weight of steam at 100 lb. initial gage pressure, which will pass through a 6 in. pipe 720 ft. long with a pressure drop of 4 lb.

Under the conditions assumed in the table, 287 lb. would flow per minute; hence, $Q = 287$ and

$$Q_1 = 287 \left(\frac{240 \times 6 \times 4}{720 \times 12} \right)^{1/4} = 234 \text{ lb.}$$

TABLE 6. FLOW OF STEAM THROUGH PIPES
LENGTH OF PIPE = 240 DIAMETERS

INITIAL GAGE PRESS., POUNDS PER SQ. IN.	DIAMETER OF PIPE IN INCHES															Density
	¾	1.0	1¼	2.0	2½	3.0	4.0	5.0	6.0	8.0	10.0	12.0	15.0	18.0		
	WEIGHT OF STEAM PER MINUTE IN POUNDS WITH ONE POUND LOSS IN PRESSURE															
1	1.13	2.04	5.49	9.85	14.8	24.4	45.0	74.2	105	202	329	482	771	1127	0.0385	
10	1.39	2.54	6.82	12.3	18.5	30.3	55.9	92.3	138	248	409	599	958	1404	0.0595	
20	1.63	2.98	8.02	14.4	21.9	35.6	65.7	108	163	295	481	705	1128	1645	0.0823	
30	1.84	3.37	9.07	16.2	24.5	40.2	74.1	122	183	333	542	795	1272	1858	0.1047	
40	2.03	3.71	9.95	17.9	26.9	44.2	81.6	135	202	366	596	874	1388	2089	0.1267	
50	2.19	4.02	10.8	19.4	29.2	47.9	88.3	146	219	397	646	948	1515	2214	0.1486	
60	2.35	4.30	11.5	20.7	31.2	51.3	93.7	156	234	424	691	1014	1623	2372	0.1703	
70	2.50	4.56	12.3	22.0	33.1	54.4	100	166	248	451	734	1075	1722	2517	0.1919	
80	2.63	4.81	12.9	23.2	34.9	57.4	106	175	262	475	774	1135	1814	2653	0.2134	
90	2.76	5.05	13.6	24.3	36.6	60.2	111	183	275	499	812	1192	1893	2782	0.2347	
100	2.88	5.27	14.2	25.4	38.3	62.8	116	191	287	520	848	1243	1990	2908	0.2560	
120	3.10	5.69	15.3	27.4	41.3	67.9	125	207	310	562	915	1342	2148	3138	0.2985	
150	3.38	6.26	16.8	30.2	45.5	74.7	138	228	341	619	1007	1477	2361	3450	0.3616	
200	3.88	6.96	19.1	34.3	51.5	84.8	156	258	387	703	1144	1677	2685	3919	0.4664	
250	4.33	7.86	21.1	37.9	57.1	93.7	173	285	428	776	1264	1855	2962	4337	0.5695	
300	4.68	8.56	23.0	41.2	62.1	102	188	310	466	845	1376	2019	3226	4717	0.6748	
350	5.03	9.22	24.7	44.5	66.8	110	202	334	501	908	1478	2168	3467	5060	0.7788	

*From Marks' and Davis' Tables.

HEATING CONDUITS

Conduits for steam pipes buried underground should be water-proof, able to withstand earth loads and take care of the expansion and contraction of the piping without strain or stress on the couplings, also without affecting the installation or conduit. Expansion of the piping must be carefully controlled by means of anchors and expansion joints or bends so that the pipes can never come in contact with the conduit. Anchors can be anchor fittings or U-shaped steel straps which partially encircle the pipes and are firmly bolted to a short length of structural steel set in concrete.

In laying out conduits of this type the following points should be borne in mind:

1. The conduit should be laid out in successive straight runs between manholes or anchor pits.
2. An anchor should be placed wherever the line changes direction.